CERTIFICATION TEST REPORT

FOR THE

WIRELESS CABLE MODEM TRANSCEIVER, 520006-1 & 520006-2

FCC PART 2 AND PART 27 COMPLIANCE

DATE OF ISSUE: MAY 2, 2000

PREPARED FOR:

California Amplifier, Inc.
460 Calle San Pablo
Camarillo, CA 93012

P.O. No: 21262
W.O. No: 73952

PREPARED BY:

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5473A Clouds Rest
Mariposa, CA 95338

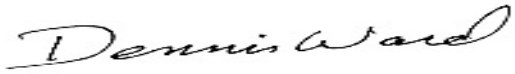
Date of test: March 16-17, 2000

Report No: FC00-040

DOCUMENTATION CONTROL:

Tracy Phillips
Documentation Control Supervisor
CKC Laboratories, Inc.

APPROVED BY:



Dennis Ward
Director of Laboratories
CKC Laboratories, Inc.

TABLE OF CONTENTS FOR
PART 2 AND PART 27 CERTIFICATION TEST REPORT

ADMINISTRATIVE INFORMATION

DATE OF TEST:	March 16-17, 2000
PURPOSE OF TEST:	To demonstrate the compliance of the Wireless Cable Modem Transceiver, 520006-1 & 520006-2, with the requirements for FCC Part 2 and Part 27 devices.
MANUFACTURER:	California Amplifier, Inc. 460 Calle San Pablo Camarillo, CA 93012
REPRESENTATIVE:	Carlos Briceno
TEST LOCATION:	CKC Laboratories, Inc. 5473A Clouds Rest, Mariposa, CA 95338
TEST PERSONNEL:	Skip Doyle
TEST METHOD:	FCC Part 2 and 27
FREQUENCY RANGE TESTED:	30 MHz – 23.14 GHz

EQUIPMENT UNDER TEST:

Wireless Cable Modem Transceiver w/ 24 dBi Antenna

Manuf:	California Amplifier, Inc.
Model:	520006-1
Serial:	0010000021
Antenna P/N:	130094/130135
FCC ID:	J26520006 (Pending)

Wireless Cable Modem Transceiver w/ 17 dBi Antenna

Manuf:	California Amplifier, Inc.
Model:	520006-2
Serial:	
Antenna P/N:	560000
FCC ID:	J26520006 (Pending)

SUMMARY OF RESULTS

The California Amplifier, Inc. Wireless Cable Modem Transceiver, 520006-1 and 520006-2, were tested in accordance with FCC Part 27 devices. As received, the above equipment was found to be fully compliant with the limits of FCC Part 27 devices. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Up/Down converter working in conjunction with a cable modem.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ±4dB measurement uncertainty.

EUT OPERATING FREQUENCY

The EUT was operating at 2307.98– 2314.02 MHz.

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within +15°C and + 35°C.
The relative humidity was between 20% and 75%.

PERIPHERAL DEVICES

The EUT was tested with the following peripheral devices:

Power Supply 22VDC 750mA
Manuf: Unknown
Model: 71441
Serial:
FCC ID: N/A

Laptop PC
Manuf: Sony
Model: PCG-717
Serial: 28980430 3304916
FCC ID: DoC

Modem
Manuf: Hybrid Networks
Model: N231
Serial: 82AAP001759
FCC ID: DoC

2.1033(c)(4) – Types of Emissions

5M00M1D

2.1033(c)(5) – Frequency Range

2305 – 2317 MHz.

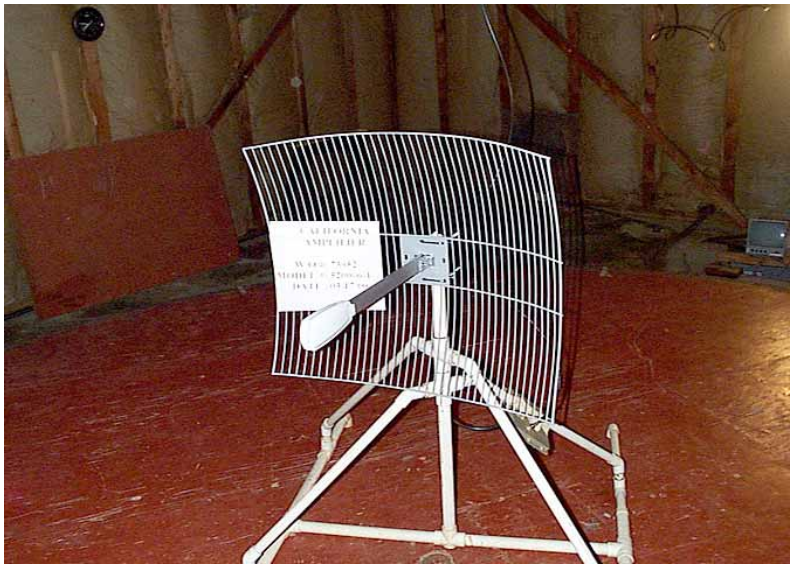
2.1033(c)(7) – Maximum Power Rating

Maximum power rating as defined in the operating part(s) of the rules.

.12589 watts

2.1033(c)(14)/2.1046/27.50(a) - RF POWER OUTPUT

TEST SETUP PHOTOS:



520006-1 Front View

520006-1 Back View

520006-2 Front View

520006-2 Back View

Note: The transmitter (520006-1) was not tested mounted inside the planar antenna (560000), as it is sold.

TEST EQUIPMENT USED:

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2209A01404. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
2. Display, Hewlett Packard, Model No. 8566B, S/N 2403A08241. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
3. QP Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
4. Preamplifier, Hewlett Packard, Model No. 8449B, S/N 300A00301. Calibration date: April 27, 1999. Calibration due date: April 27, 2000.
5. Filter, High Pass, K & L, Model No. 91H31, S/N 3000 00001. Calibration date: August 9, 1999. Calibration due date: August 9, 2000.
6. Horn Antenna, EMCO, Model No. 3115, S/N 4085. Calibration date. February 7, 2000. Calibration due date: February 7, 2001.

VIDEO BANDWIDTH AND RESOLUTION BANDWIDTH SETTINGS:

Frequency Range	Signal Analyzer VBW & RBW Setting
2308MHz – 2314MHz	1MHz

TEST DATA:

Test Location:	5473 Clouds Rest • • • Mariposa, CA 95338		
Customer:	**CALIFORNIA AMPLIFIER**		
Specification:	**FCC 2.1046/27.50(a)**		
Work Order #:	**73952**	Date:	03/17/2000
Test Type:	**RF Power Output**	Time:	10:24:26
Equipment:	**Integrated MDS-MMDS Transceiver**	Sequence#:	3
Manufacturer:	California Amplifier	Tested By:	Skip Doyle
Model:	520006-1		
S/N:	0010000021		

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Integrated MDS-MMDS Transceiver	California Amplifier	520006-1	0010000021
24 dBi Antenna	California Amplifier	130094/130135	7400033619

Support Devices:

Function	Manufacturer	Model #	S/N
Power Supply 22VDC 750mA	Unknown	71441	
Modem	Hybrid Networks	N231	82AAP001759
Laptop PC	Sony	PCG-717	28980430 3304916

Test Conditions / Notes:

EUT in located on the turntable and operating on Low Channel of 2308MHz and High Channel 2314MHz. Fundamental field strength on the OATS.

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	GHz Cable		Horn		Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	DB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2314.020M	105.4	+8.8		+29.3		+10.0	153.5	170.0	-16.5	Vert
2	2307.980M	105.3	+8.8		+29.3		+10.0	153.4	170.0	-16.6	Vert
3	2313.970M	103.1	+8.8		+29.3		+10.0	151.2	170.0	-18.8	Horiz

Test Location:	5473 Clouds Rest • • • Mariposa, CA 95338		
Customer:	**CALIFORNIA AMPLIFIER**		
Specification:	**FCC 2.1046/27.50(a)**		
Work Order #:	**73952**	Date:	03/17/2000
Test Type:	**RF Power Output**	Time:	10:38:34
Equipment:	**Integrated WCS-MMDS Transceiver**	Sequence#:	4
Manufacturer:	California Amplifier	Tested By:	Skip Doyle
Model:	520006-2		
S/N:			

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Integrated WCS-MMDS Transceiver	California Amplifier	520006-1	0010000021
17 dBi Passive Planar Antenna	California Amplifier	560000	E0500000001

Support Devices:

Function	Manufacturer	Model #	S/N
Power Supply 22VDC 750mA	Unknown	71441	
Laptop PC	Sony	PCG-717	28980430 3304916
Modem	Hybrid Networks	N231	82AAP001759

Test Conditions / Notes:

EUT in located on the turntable and operating on Low Channel of 2308MHz and High Channel 2314MHz. Fundamental field strength on the OATS. **Note: The transmitter (520006-1) was not tested mounted inside the planar antenna (560000), as it is sold.**

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	GHz Cable		Horn		Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2308.050M	102.2	+8.8		+29.3		+10.0	150.3	170.0	-19.7	Vert
2	2314.010M	101.4	+8.8		+29.3		+10.0	149.5	170.0	-20.5	Vert

2.1033(c)(14)/2.1047(a)MODULATION CHARACTERISTICS – Audio Frequency Response

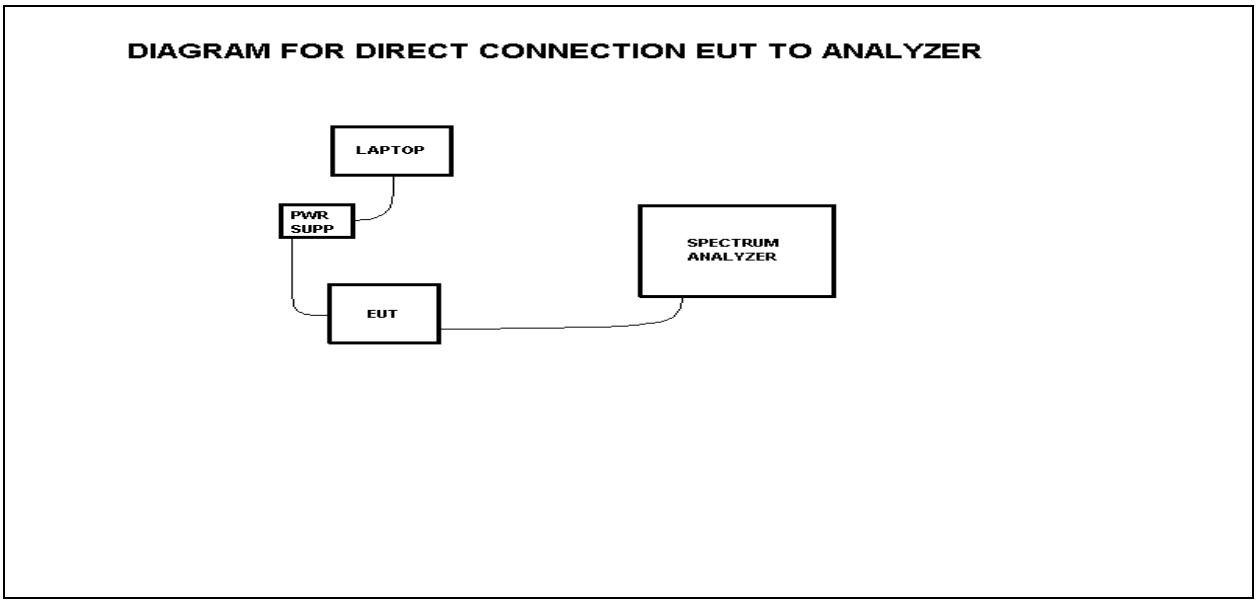
Not applicable to this unit.

2.1033(c)(14)/2.1047(b)MODULATION CHARACTERISTICS – Modulation Limiting Response

Not applicable to this unit.

2.1033(c)(14)/2.1049(i)/27.53(c) - OCCUPIED BANDWIDTH

DIAGRAM OF TEST SETUP USED FOR TEST:



TEST EQUIPMENT USED:

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2209A01404. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
2. Display, Hewlett Packard, Model No. 8566B, S/N 2403A08241. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
3. QP Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.

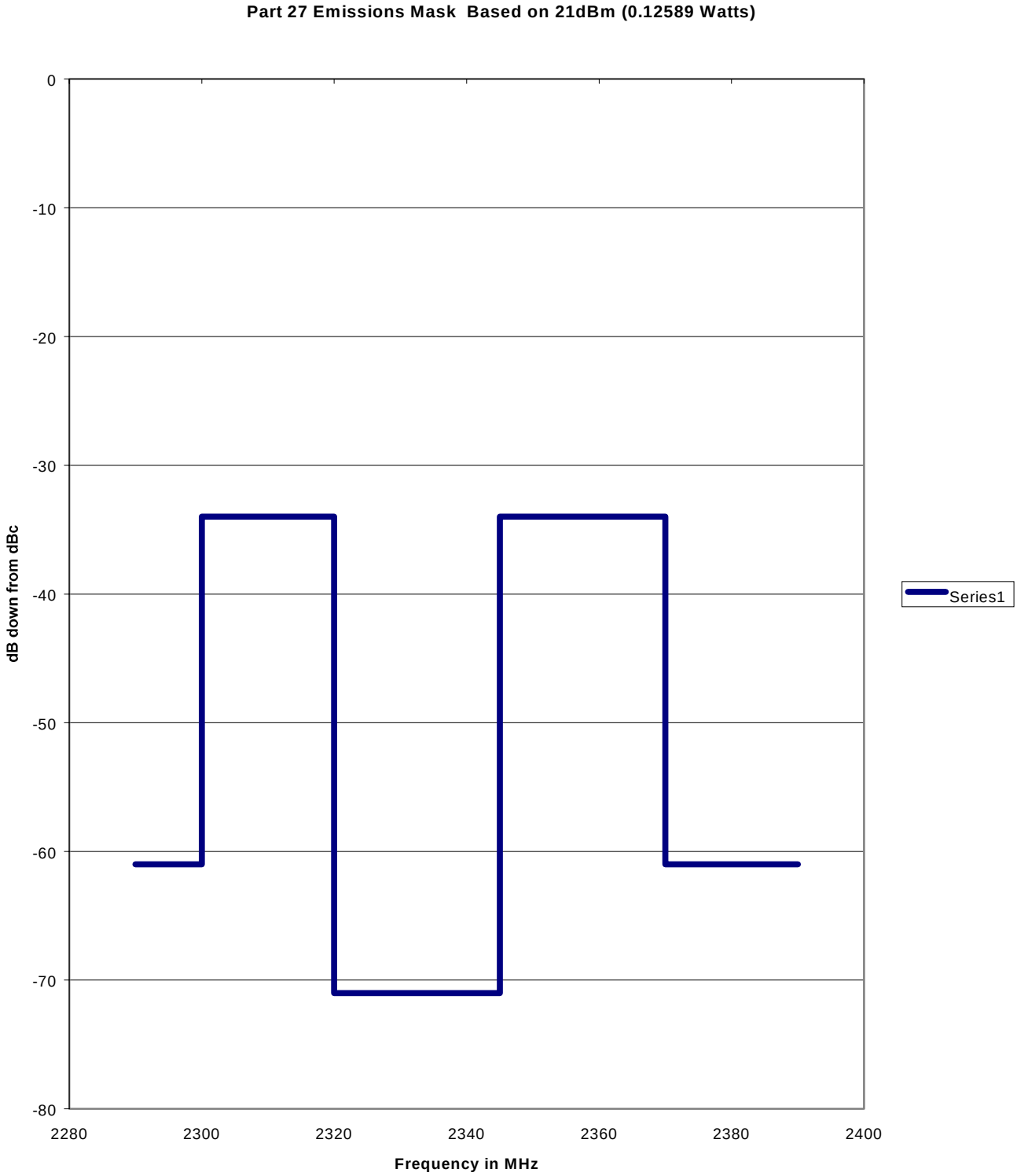
CALCULATIONS for Part 27 Emissions Mask:

Based on 21dBm = 128dBuV = 0.12589 Watts = Power

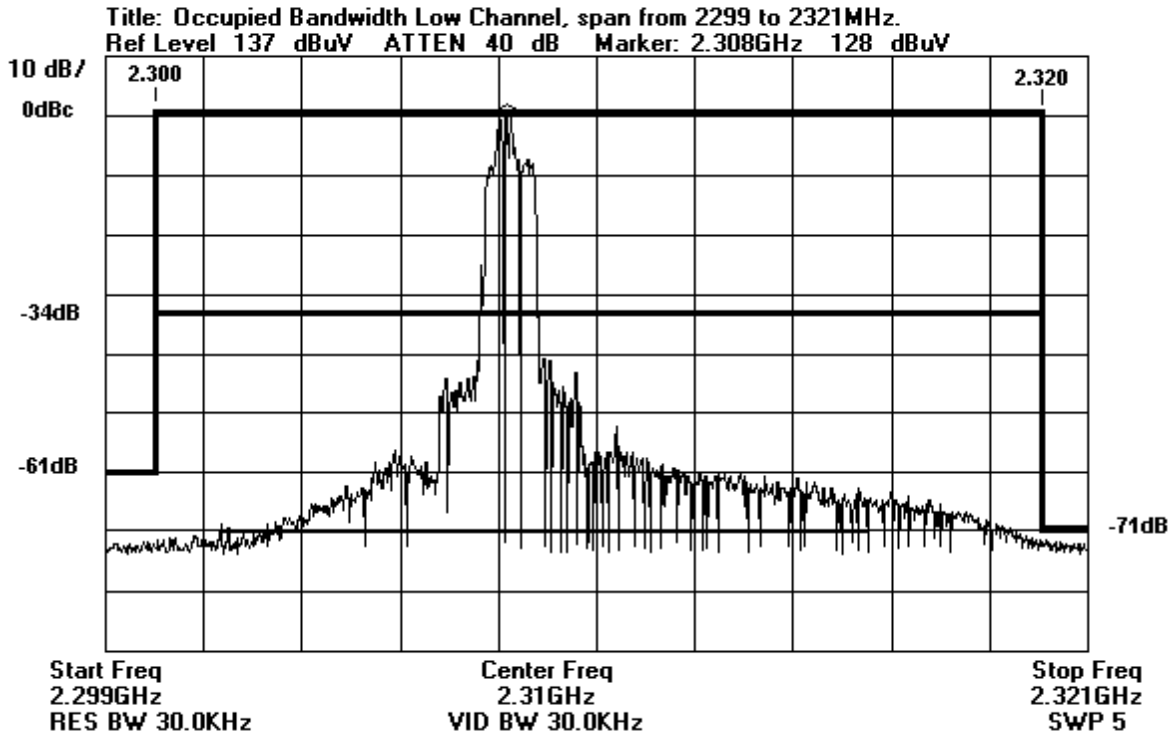
27.53 (a)(1) Fixed: dB down from dBc = 80 + 10log (p) dB on all frequencies between 2320 and 2345 MHz.
80 + (-9) = **71dB** down from dBc

27.53 (a)(3) Fixed: dB down from dBc = 70 + 10log (p) dB on all frequencies < 2300 and > 2370 MHz.
70 + (-9) = **61dB** down from dBc

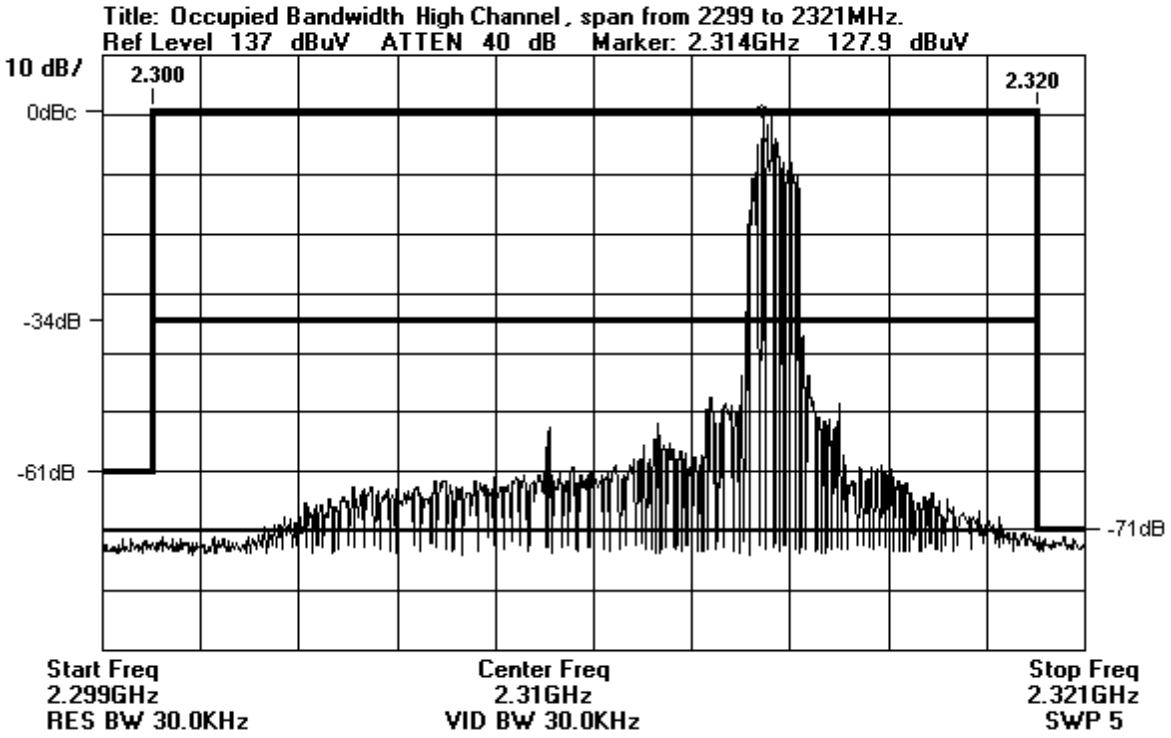
dB down from dBc = 43 + 10log (p) dB on all frequencies between 2300 and 2320 MHz and all frequencies between 2345 and 2370 that are outside the licensed bands of operation.
43 + (-9) = **34dB** down from dBc


Part 27 Emissions Mask Based on 21dBm (0.12589 Watts)
0
-10
-20
-30
-40
-50
-60
-70
-80
dB down from dBc
2280
2300
2320
2340
2360
2380
2400
Frequency in MHz
Series1

Test data: Low Channel

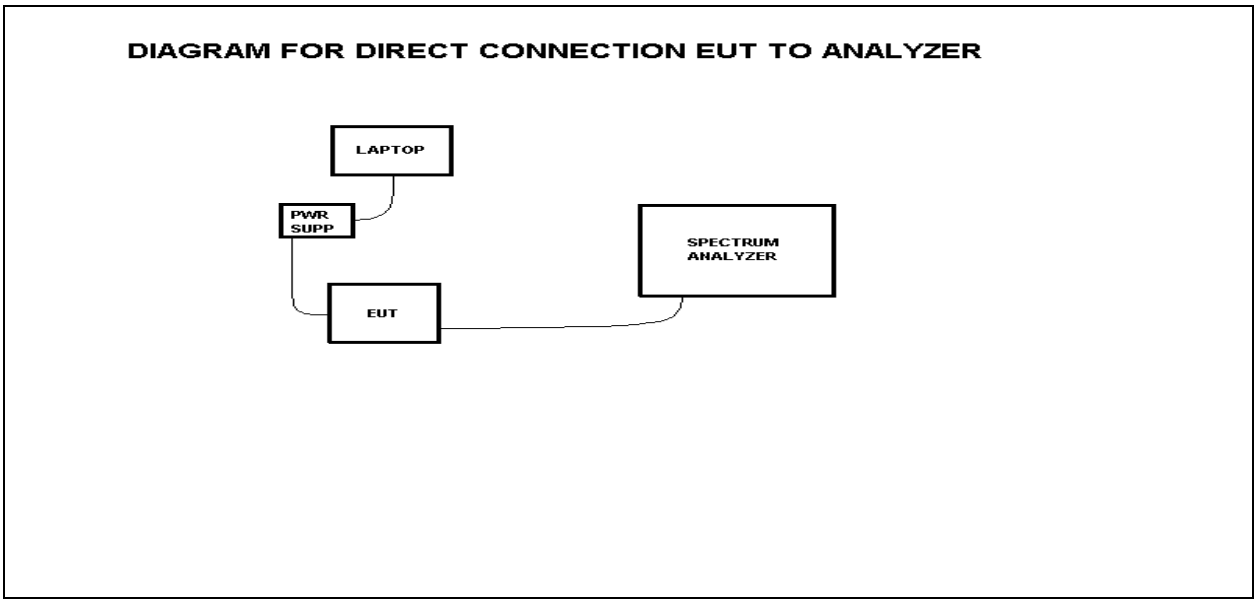


Test data: High Channel



2.1033(c)(14)/2.1051/27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINAL

DIAGRAM OF TEST SETUP USED FOR TEST:



TEST EQUIPMENT USED:

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2209A01404. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
2. Display, Hewlett Packard, Model No. 8566B, S/N 2403A08241. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
3. QP Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.

VIDEO BANDWIDTH AND RESOLUTION BANDWIDTH SETTINGS:

Frequency Range	Signal Analyzer VBW & RBW Setting
30MHz – 1000MHz	120kHz
1GHz – 23.14GHz	1MHz

Test Location:	5473 Clouds Rest • • • Mariposa, CA 95338		
Customer:	**CALIFORNIA AMPLIFIER**		
Specification:	**FCC 2.1051/27.53**		
Work Order #:	**73952**	Date:	03/16/2000
Test Type:	**Spurious Emissions at Antenna Terminal**	Time:	18:47:53
Equipment:	**WCS-MMDS Transceiver**	Sequence#:	1
Manufacturer:	California Amplifier	Tested By:	Skip Doyle
Model:	520006-1		
S/N:	0010000021		

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
WCS-MMDS Transceiver	California Amplifier	520006-1	0010000021

Support Devices:

Function	Manufacturer	Model #	S/N
Power Supply 22VDC 750mA	Unknown	71441	
Laptop PC	Sony	PCG-717	28980430 3304916
Modem	Hybrid Networks	N231	82AAP001759

Test Conditions / Notes:

EUT in located on the bench in front of the spectrum analyzer and is direct connected through an 18 inch coax cable for spurious emissions from 30MHz to 23.14GHz. Operating on Low Channel of 2308MHz.

Measurement Data: Reading listed by margin. Test Distance: Direct Connection

#	Freq MHz	Rdng dBµV	dB	dB	dB	GHz C dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	1650.912M	58.9				+0.2	+0.0	59.1	67.0	-7.9	None
2	6924.170M	57.2				+1.6	+0.0	58.8	67.0	-8.2	None
3	1651.290M	57.5				+0.2	+0.0	57.7	67.0	-9.3	None
4	101.600M	50.3				+0.0	+0.0	50.3	67.0	-16.7	None
5	743.000M	50.2				+0.0	+0.0	50.2	67.0	-16.8	None
6	407.800M	50.2				+0.0	+0.0	50.2	67.0	-16.8	None
7	283.700M	50.1				+0.0	+0.0	50.1	67.0	-16.9	None
8	349.600M	50.0				+0.0	+0.0	50.0	67.0	-17.0	None
9	62.620M	50.0				+0.0	+0.0	50.0	67.0	-17.0	None
10	505.700M	49.9				+0.0	+0.0	49.9	67.0	-17.1	None
11	2142.979M	49.4				+0.4	+0.0	49.8	67.0 Local Oscillator	-17.2	None
12	11390.07M	46.9				+0.8	+0.0	47.7	67.0	-19.3	None

Test Location:	5473 Clouds Rest • • • Mariposa, CA 95338		
Customer:	**CALIFORNIA AMPLIFIER**		
Specification:	**FCC 2.1051/27.53**		
Work Order #:	**73952**	Date:	03/16/2000
Test Type:	**Spurious Emissions at Antenna Terminal**	Time:	19:11:01
Equipment:	**WCS-MMDS Transceiver**	Sequence#:	2
Manufacturer:	California Amplifier	Tested By:	Skip Doyle
Model:	520006-1		
S/N:	0010000021		

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
WCS-MMDS Transceiver	California Amplifier	520006-1	0010000021

Support Devices:

Function	Manufacturer	Model #	S/N
Power Supply 22VDC 750mA	Unknown	71441	
Laptop PC	Sony	PCG-717	28980430 3304916
Modem	Hybrid Networks	N231	82AAP001759

Test Conditions / Notes:

EUT in located on the bench in front of the spectrum analyzer and is direct connected through an 18 inch coax cable for spurious emissions from 30MHz to 23.14GHz. Operating on High Channel of 2314MHz.

Measurement Data: Reading listed by margin. Test Distance: Direct Connection

#	Freq MHz	Rdng dBµV	dB	dB	dB	GHz C dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2142.979M	54.0					+0.0	54.4	67.0	-12.6	None
						+0.4			Local Oscillator		
2	12857.97M	49.1					+0.0	48.6	67.0	-18.4	None
						-0.5					
3	17143.96M	46.6					+0.0	48.6	67.0	-18.4	None
						+2.0					
4	6428.960M	45.1					+0.0	47.8	67.0	-19.2	None
						+2.7					
5	4285.960M	47.1					+0.0	46.9	67.0	-20.1	None
						-0.2					
6	33.484M	46.8					+0.0	46.8	67.0	-20.2	None
						+0.0			Clock		
7	8571.960M	42.6					+0.0	43.0	67.0	-24.0	None
						+0.4					
8	10714.96M	41.5					+0.0	42.5	67.0	-24.5	None
						+1.0					
9	67.010M	39.1					+0.0	39.1	67.0	-27.9	None
						+0.0					

2.1033(c)(14)/2.1053/27.55 - FIELD STRENGTH OF SPURIOUS RADIATION

TEST SETUP PHOTOS:

Front View of Transmitter

Back View of Transmitter

TEST EQUIPMENT USED:

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2209A01404. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
2. Display, Hewlett Packard, Model No. 8566B, S/N 2403A08241. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
3. QP Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
4. Preamplifier, Hewlett Packard, Model No. 8449B, S/N 300A00301. Calibration date: April 27, 1999. Calibration due date: April 27, 2000.
5. Filter, High Pass, K & L, Model No. 91H31, S/N 3000 00001. Calibration date: August 9, 1999. Calibration due date: August 9, 2000.
6. Horn Antenna, EMCO, Model No. 3115, S/N 4085. Calibration date. February 7, 2000. Calibration due date: February 7, 2001.

TEST DATA:

MODEL: 520006-1, CHANNEL: Low 2308MHz									
Polarity	**Spurious Emission Freq(MHz)**	**Reading in dBuV/m**	**Total Transducer Factors**	**3 Meter Distance Factor**	**Corrected Reading (dBuV/M)**	**V/M**	**ERP (Watts)**	**Spec Limit Watts**	**Pass / Fail**
Horiz	6429.055	29	29.9	0	58.9	0.000881049	0.000000142	0.000003467	Pass
Vert	6428.869	28.8	29.9	0	58.7	0.000860994	0.000000136	0.000003467	Pass
Horiz	4286.035	30.5	13	0	43.5	0.000149624	0.000000004	0.000003467	Pass
Vert	1955.528	43.8	-0.9	0	42.9	0.000139637	0.000000004	0.000003467	Pass
Vert	4286.012	29.6	13	0	42.6	0.000134896	0.000000003	0.000003467	Pass
Horiz	2143.007	36.6	1.8	0	38.4	0.000083176	0.000000001	0.000003467	Pass

CALCULATIONS

Note: The data taken on the **OATS** is relative to the radiated power of each spurious emission with reference to the rated power output of the transmitter.

Per 27.53: 36.4 dBm - 61dBc = - 24.6 dBm (82.4dBuV)

Power in watts = Inv Log (-24.6dBm/10)/1000 =
0.000003467W

Spec Limit = 0.000003467 Watts for Low Channel (2308MHz)

To get power in Watts, V/m and ERP, enter field strength of fundamental at 3 meters here:

dBuV 3m	Power Watts	V/m	ERP	**OR**	dBm 3m	Power Watts	V/m	ERP
143.4	4.365158322	14.79108388	40.0200297		36.4	4.365158322	14.79108388	40.02002971

ERP = $(Ed)^2/30(G)$

E = V/m

d= distance

G = Gain of Antenna (numerical gain of half wave dipole antenna 1.64) per Part 2.1053(a)

Conversion of dBuV/m to V/m

[invlog(Reading in dBuV/m/20)]*.000001 = V/m

MODEL: 520006-1, CHANNEL: High 2314MHz									
Polarity	**Spurious Emission Freq(MHz)**	**Reading in dBuV/m**	**Total Transducer Factors**	**3 Meter Distance Factor**	**Corrected Reading (dBuV/M)**	**V/M**	**ERP (Watts)**	**Spec Limit Watts**	**Pass / Fail**
Horiz	6428.983	29.6	29.9	0	59.5	0.000944061	0.000000163	0.000003548	Pass
Vert	6429.055	27.9	29.9	0	57.8	0.000776247	0.000000110	0.000003548	Pass
Horiz	4286.131	31.5	13	0	44.5	0.000167880	0.000000005	0.000003548	Pass
Vert	4286.03	30.6	13	0	43.6	0.000151356	0.000000004	0.000003548	Pass
Vert	1955.548	43	-0.9	0	42.1	0.000127350	0.000000003	0.000003548	Pass
Horiz	1955.523	42.5	-0.9	0	41.6	0.000120226	0.000000003	0.000003548	Pass

CALCULATIONS

Note: The data taken on the **OATS** is relative to the radiated power of each spurious emission with reference to the rated power output of the transmitter.

Per 27.53: 36.5 dBm - 61dBc = - 24.5 dBm (82.5dBuV)

Power in watts = Inv Log (-24.5dBm/10)/1000 = 0.000003548W

Spec Limit = 0.000003548 Watts for High Channel (2314MHz)

To get power in Watts, V/m and ERP, enter field strength of fundamental at 3 meters here:

dBuV 3m	Power Watts	V/m	ERP	**OR**	dBm 3m	Power Watts	V/m	ERP
143.5	4.466835922	14.96235656	40.9522159		36.5	4.466835922	14.96235656	40.95221595

ERP = $(Ed)^2/30(G)$

E = V/m

d= distance

G = Gain of Antenna (numerical gain of half wave dipole antenna 1.64) per Part 2.1053(a)

Conversion of dBuV/m to V/m

[invlog(Reading in dBuV/m/20)]*.000001 = V/m

2.1033(c)(14)/2.1055/27.54 - FREQUENCY STABILITY

TEST SETUP PHOTOS:

TEST EQUIPMENT USED:

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2209A01404. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
2. Display, Hewlett Packard, Model No. 8566B, S/N 2403A08241. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
3. QP Adapter, Hewlett Packard, Model No. 85650A, S/N 1532A03198. Calibration date: July 7, 1999. Calibration due date: July 7, 2000.
4. Temperature Chamber Thermotron Corp S-1.2 Mini Max 11899. Calibration date: March 29, 1999. Calibration Due: March 29, 2000.
5. Digital Multimeter, Radio Shack, Model 22-183. Calibration date: September 13, 1999. Calibration Due: September 13, 2000.
6. Frequency Counter, Fluke, Model 1912A, S/N 2270008. Calibration date: September 23, 1999. Calibration Due: September 23, 2000.

VIDEO BANDWIDTH AND RESOLUTION BANDWIDTH SETTINGS:

Frequency Range	Signal Analyzer VBW & RBW Setting
2305MHz – 2320MHz	1MHz

TEST DATA:

Conditions: Set chamber to -30°C. Voltage varied +/- 15% in accordance with FCC Part 2.1055(d)(1) for 102 VAC and 138 VAC. Due to metal enclosure, allowing 1 hour stabilization. Unable to check Low and High channels. EUT unable to produce unmodulated signal at those frequencies and the counter will not read the modulated signal of the fundamental. 2278 LO disabled so the 2143 LO can be read.
Measured Readings:
-30°C LIMIT (Hz) f +V = 2.143002600 GHz V = 2.143002700 GHz -V = 2.143002600GHz
-20°C LIMIT (Hz) f +V = 2.143002200 GHz V = 2.143002200 GHz -V = 2.143002200GHz
-10°C LIMIT (Hz) f +V = 2.143001800 GHz V = 2.143001700 GHz -V = 2.143001800GHz
0°C LIMIT (Hz) f +V = 2.142999400 GHz V = 2.142999500 GHz -V = 2.142999400GHz
10°C LIMIT (Hz) f +V = 2.142995500 GHz V = 2.142995500 GHz -V = 2.142995500GHz
20°C LIMIT (Hz) f +V = 2.142992200 GHz V = 2.142992200 GHz -V = 2.142992200GHz
30°C LIMIT (Hz) f +V = 2.142990500 GHz V = 2.142990500 GHz -V = 2.142990500GHz

40°C LIMIT (Hz) f +V = 2.142989500 GHz V = 2.142989500 GHz -V = 2.142989500GHz
50°C LIMIT (Hz) f +V = 2.142990200 GHz V = 2.142990100 GHz -V = 2.142990100GHz
$F_H$max = 2.143002600 GHz $F_L$min = 2.142989500 GHz **Delta = 13,100 Hz (13.1 kHz)**